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# High-resolution optical spectroscopy of Tm3+ ions in LiYF4: Crystal-field energies, hyperfine and deformation splittings, and the isotopic structure

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## Abstract

High-resolution optical Fourier spectroscopy was used to study the energies and widths of the crystal-field (CF) levels, hyperfine and deformation level splittings, and isotopic effects in the LiYF4: Tm3+ single crystals. We present the corrected sets of the CF levels and CF parameters for the Tm 3+ ion in LiYF4. The observed fine structure of spectral lines is shown to be caused by the hyperfine interaction, random lattice deformations, and isotopic disorder in the lithium sublattice. From a comparison between the observed and calculated fine structures we determine the characteristics of the random lattice deformations in highly diluted activated crystals and obtain an estimate of the fluorine displacements (3× 10-5 nm) in the nearest surrounding of the mass defect at the lithium site. © 2010 The American Physical Society.

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